NON-PUBLIC?: N
ACCESSION #: 9202260046
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Palo Verde Unit 3 PAGE: 1 OF 07

DOCKET NUMBER: 05000530

TITLE: Reactor Trip Following Reactor Power Cutback Due to Loss of Main Feedwater Pump
EVENT DATE: 01/24/92 LER #: 92-001-00 REPORT DATE: 02/18/92

OTHER FACILITIES INVOLVED: N/A DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Thomas R. Bradish, Compliance Engineer TELEPHONE: (602) 393-5421

COMPONENT FAILURE DESCRIPTION:
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

On January 24, 1992, at approximately 1750 MST, Palo Verde Unit 3 was in Mode 1 (POWER OPERATION) at approximately 100 percent power when a reactor trip occurred following a reactor power cutback which was initiated when Control Room personnel manually tripped the main feedwater pump "B" (MFWP). The MFWP "B" was tripped in an attempt to stabilize the suction pressure for the MFWP "A" following the receipt of MFWP low suction pressure trip alarms for both operating MFWPs. Following the reactor trip, the plant was stabilized in Mode 3 (HOT STANDBY) at normal operating temperature and pressure. At approximately 1816 MST, the event was classified as an uncomplicated reactor trip. All plant equipment responded as expected. No engineered safety feature actuation system actuations occurred and none were required.

The MFWP low suction pressure occurred when the MFWP mini-flow

recirculation valves failed open on loss of instrument air pressure. As corrective action, the instrument air line was repaired.

There have been no previous similar events reported pursuant to 10CFR50.73.

END OF ABSTRACT

I. DESCRIPTION OF WHAT OCCURRED:

A. Initial Conditions:

At 1750 MST on January 24, 1992, Palo Verde Unit 3 was in Mode 1 (POWER OPERATION) at approximately 100 percent power.

B. Reportable Event Description (Including Dates and Approximate Times of Major Occurrences):

Event Classification: An event or condition that resulted in manual or automatic actuation of any Engineered Safety Feature (ESF) (JE), including the Reactor Protection System (RPS)(JC).

At approximately 1750 MST on January 24, 1992, an automatic reactor (RCT)(AC) trip occurred following a reactor power cutback (RPCB) (JC) which was initiated when Control Room (NA) personnel (utility, licensed) manually tripped the main feedwater pump "B" (MFWP) (SJ)(P). The MFWP "B" was tripped in an attempt to stabilize the suction pressure for the MFWP 'A" following the receipt of MFWP low suction pressure trip alarms (PA) for both operating MFWPs. Following the reactor trip, the plant was stabilized in Mode 3 (HOT STANDBY) at normal operating temperature and pressure. At approximately 1816 MST, the event was classified as an uncomplicated reactor trip. All plant equipment responded as expected. No engineered safety feature actuation system (ESFAS) (JE) actuations occurred and none were required.

Prior to the event, at approximately 1750 MST on January 24, 1992, Control Room personnel (utility, licensed) observed that the MFWP "B" high pressure steam lead drain valve (V) indicated open with the switch in the closed position, that the speed of both MFWP turbines was increasing, and that mini-flow

recirculation valves on both MFWPs were open. When the MFWP low suction pressure trip alarms were received in the Control Room for both operating MFWPs, the assistant shift supervisor (utility, licensed) promptly diagnosed the plant's condition and directed Control Room personnel to trip the MFWP "B" in an attempt to stabilize the suction pressure for the MFWP "A" prior to the MFWP trips. The MFWPs are designed to trip sequentially (e.g., MFWP "B" in 15 seconds and MFWP "A" in 20 seconds) after receipt of low suction pressure trip alarms. When Control Room personnel tripped the MFWP "B", an RPCB was automatically initiated, the main turbine (TA) steam demand was reduced, and the in-service steam bypass control valves (V)(JI) modulated open to control reactor coolant

system (RCS) (AB) temperature. These system responses were per design upon loss of a MFWP.

In response to the RPCB, selected control element assemblies (CEA) (ROD)(AA) from Regulating Groups (RG) 4 and 5 dropped into the reactor core, reducing reactor power. Shortly after the RGs 4 and 5 CEAs dropped into the core, Core Protection Calculator (CPC) (JC)(CPU) Channels A, C, and D low Departure from Nucleate Boiling Ratio (DNBR) and high Local Power Density (LPD) trip signals were generated, satisfying the two-out-of-four trip logic for the RPS. This resulted in a reactor trip and subsequent main turbine generator (TA/TB)(TG) trip.

The low DNBR/high LPD reactor trip was due to the application of penalty factors generated by control element assembly calculators (CEACs) (JC) associated with a CEA out-of-sequence condition (e.g., RG 4 CEAs were below RG 5 CEAs in the region

of 10 inches to 30 inches withdrawn) and sent to the CPCs which had a zero (0) second RPCB flag delay time. With the RPCB timer set to 0.0 seconds, there was no delay time to allow the CEA positions to stabilize in response to the RPCB condition (Reference LER 530/91-008-00 for a description concerning the delay time being set to 0.0 seconds).

The reactor trip signal was initiated approximately 15 seconds after receiving the MFWP low suction pressure trip alarms. Following the reactor trip, the plant was stabilized in Mode 3 (HOT STANDBY) at normal operating temperature and pressure. At

approximately 1816 MST, the assistant shift supervisor classified the event as an uncomplicated reactor trip. All plant equipment responded as expected. There were no ESFAS actuations and none were required. Main feedwater remained available throughout the event and no steam generator low levels occurred.

Following the reactor trip, two auxiliary operators (utility, nonlicensed) responded to the MFWP area to investigate the problem with MFWP low suction pressure. They discovered that a valve had separated from an instrument air (LD) drain line located on an instrument air header. The header supplies instrument air to several secondary components, including the mini-flow recirculation valves on both MFWPs. The MFWP mini-flow recirculation valves failed open on loss of instrument air pressure, as designed. The opening of the MFWP mini-flow recirculation valves created an additional feedwater flow path, resulting in decreased MFWP suction pressure, decreased steam generator (AB) level, and increased MFWP turbine speed and feedwater flow.

C. Status of structures, systems, or components that were inoperable at the start of the event that contributed to the event:

Not applicable - no structures, systems, or components were inoperable at the start of the event which contributed to this event.

Prior to this event, CPC Channel C was placed in bypass due to receipt of unexplained spurious trips on January 21, 1992. A review of this event determined that this condition did not contribute to this event since the trip logic would have been satisfied by any combination of CPC Channels A, B, or D.

D. Cause of each component or system failure, if known:

An independent investigation of this event was conducted in accordance with the APS Incident Investigation Program. As part of the investigation, an APS Engineering assessment was performed to determine why the valve had separated from the instrument air header drain line.

The Engineering assessment determined that the instrument air

valve had separated from its copper instrument air drain line when the solder joint failed. The root cause of the failure cannot be absolutely determined since the same valve was temporarily resoldered to the airline shortly after the event in order to restore instrument air. However, based on subsequent investigation, APS Engineering has determined that the apparent cause was an inadequate solder joint between the valve and the air line. This was the original construction solder joint. APS Engineering believes this to be an isolated case.

E. Failure mode, mechanism, and effect of each failed component, if known:

The instrument air valve was separated from its copper instrument air drain line when its solder joint failed. The instrument air drain line is located on an instrument air header. The header supplies instrument air to several secondary components, including the mini-flow recirculation valves on both MFWPs. The MFWP mini-flow recirculation valves failed open on loss of instrument air pressure, as designed. The opening of the MFWP mini-flow recirculation valves created an additional feedwater flow path, resulting in decreased MFWP suction pressure, decreased steam generator level, and increased MFWP turbine speed and feedwater flow. MFWP low suction pressure trip alarms occurred in the

Control Room and Control Room personnel took prompt action, as previously described in Section I.B.

F. For failures of components with multiple functions, list of systems or secondary functions that were also affected:

The instrument air drain line is located on an instrument air header. The header supplies instrument air to several secondary components, including the mini-flow recirculation valves on both MFWPs. MFWP "B" high pressure steam lead drain valve indicated open with the switch in the closed position. However, no other systems were found to be adversely affected as a result of the solder joint failure.

G. For a failure that rendered a train of a safety system inoperable, estimated time elapsed from the discovery of the failure until the train was returned to service:

Not applicable - no failures that rendered a train of a safety system inoperable were involved.

H. Method of discovery of each component or system failure or procedural error:

As previously described in Section I.B, following the reactor trip, two auxiliary operators responded to the MFWP area to investigate the problem with MFWP low suction pressure. They discovered that a valve had separated from an instrument air drain line located on an instrument air header. There were no procedural errors which contributed to this event.

I. Cause of Event:

An independent investigation of this event was conducted in accordance with the APS Incident Investigation Program. As part of the investigation, a determination of the cause of the event was performed. As discussed in Section I.D, an APS Engineering assessment of the instrument air solder joint failure was performed. APS Engineering determined that the apparent cause was an inadequate solder joint between the valve and the air line (SALP Cause Code E: Component Failure). APS Engineering believes this to be an isolated case.

Shortly after the RGs 4 and 5 CEAs dropped into the reactor core, CPC Channels A, C, and D low DNBR and high LPD trip signals were generated, satisfying the two-out-of-four trip logic for the RPS.

This resulted in a reactor trip and subsequent main turbine generator trip.

The low DNBR/high LPD reactor trip was due to the application of penalty factors generated by CEACs associated with a CEA out-of-sequence condition (e.g., RG 4 CEAs were below RG 5 CEAs in the region of 10 inches to 30 inches withdrawn) and sent to the CPCs which had a zero (0) second RPCB flag delay time. With the RPCB timer set to 0.0 seconds, there was no delay time to allow the CEA positions to stabilize in response to the RPCB condition (Reference LER 530/91-008-00 for a description concerning the delay time being set to 0.0 seconds).

No unusual characteristics of the work location (e.g., noise, heat, poor lighting) directly contributed to this event. There were no procedural errors which contributed to this event. There were no personnel errors which contributed to this event.

J. Safety System Response:

The Plant Protection System (JC) responded to the transient as designed. The reactor was automatically tripped when CPC Channels A, C, and D low DNBR/high LPD trip signals were generated, satisfying the two-out-of-four trip logic for the RPS. There were no other safety system responses, including ESFAS actuations, and none were required.

K. Failed Component Information:

The inadequate solder joint joined a one-inch globe instrument air valve to an instrument air drain line. This was the original construction solder joint. APS Engineering believes this to be an isolated case.

II. ASSESSMENT OF THE SAFETY CONSEQUENCES AND IMPLICATIONS OF THIS
EVENT:

The low DNBR/high LPD reactor trip was automatically initiated prior to exceeding the DNBR and LPD safety limits and was diagnosed as an uncomplicated reactor trip. The CPC/CEACs responded as designed with no complications. The plant responded as designed, no safety limits were exceeded, and the event was bounded by the safety analyses in the Palo Verde Updated Final Safety Analysis Report (FSAR) Chapters 6 and 15.

The event did not result in any challenges to the fission product barriers or result in any releases of radioactive materials. Therefore, there were no other adverse safety consequences or implications as a

result of this event. This event did not adversely affect the safe operation of the plant or the health and safety of the public.

III. CORRECTIVE ACTION:

A. Immediate:

Interim repairs were made to facilitate plant recovery when the same valve was temporarily resoldered to the air line in order to restore instrument air.

APS Engineering performed a walkdown of the instrument air supply and drain lines for all instrument air local area panels in each unit. No obvious defects were noted in any of the solder joints that were inspected.

B. Action to Prevent Recurrence:

The instrument air valve was replaced and a new valve was resoldered to the instrument air drain line. APS Engineering retrieved the original valve and the piece of the copper line it was soldered to in order to perform a root cause of failure analysis. Due to the resoldering and subsequent reheating involved in removing the valve, the precise condition of the original joint with respect to surface cleanliness, solder penetration and insertion depth could not be determined during the APS Engineering assessment. However, APS Engineering has determined that the apparent cause was an inadequate solder joint between the valve and the air line. APS Engineering has determined that this is an isolated occurrence and that no further actions to prevent recurrence are necessary at this time.

APS has completed the evaluation to reinstate the reactor power cutback (RPCB) time delay for MFWP trips only (reference LER 530/91-008-00). The RPCB timer was reinstated for MFWP trips.

IV. PREVIOUS SIMILAR EVENTS:

No other previous events have been reported pursuant to 10CFR50.73 where a reactor trip occurred during a RPCB which was initiated when a MFWP was manually tripped.

Arizona Public Service Company
PALO VERDE NUCLEAR GENERATING STATION
P.O. BOX 52034 o PHOENIX, ARIZONA 85072-2034

JAMES M. LEVINE 192-00773-JML/TRB/KR
VICE PRESIDENT February 18, 1992
NUCLEAR PRODUCTION

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Mail Station P1-37
Washington, D.C. 20555

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Unit 3
Docket No. STN 50-530 (License No. NPF-74)
Licensee Event Report 92-001-00
File: 92-020-404

Attached please find Licensee Event Report (LER) 92-001-00 prepared and submitted pursuant to 10CFR50.73. In accordance with 10CFR50.73(d), a copy of this LER is being forwarded to the Regional Administrator, NRC Region V.

If you have any questions, please contact T. R. Bradish, Compliance Manager, at (602) 393-5421.

Very truly yours,

JML/TRB/KR/nk

Attachment

cc: W. F. Conway (all with attachment)
J. B. Martin
D. H. Coe
INPO Records Center

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